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ORIGINAL ARTICLE

Urinary Tract Infections Among the Elderly in Benin City, Nigeria

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The elderly have an increased risk of developing urinary tract infection (UTI). This study aimed to determine the prevalence of UTI among elderly (≥60 years) patients in Benin City, Nigeria. Clean-catch midstream urine was collected from 943 (362 males and 581 females) elderly patients with signs and symptoms of UTI. Significant microbial isolates were identified in the urine specimens and an antimicrobial susceptibility test was performed on bacteria isolates using standard techniques. Male sex was a significant risk factor for acquiring UTI in the elderly (odds ratio=6.584; 95% confidence interval=4.081, 10.62; $p<0.0001$). There was an inverse relationship between age and prevalence of UTI, as the prevalence of UTI significantly declined with increasing age ($p=0.023$). *Escherichia coli* was the most common uropathogen (36.79%) in both sexes of elderly patients. Bacterial isolates were poorly susceptible to antibacterial agents used. An overall prevalence of 11.03% of UTI was observed among the elderly. Male sex showed an approximately 4–11-fold increased risk of acquiring UTI. The prevalence of UTI among the elderly decreases with increasing age. Rational use of antibiotics is advocated to stem the tide of high antibacterial resistance.

Key Words: elderly; Nigeria; prevalence; urinary tract infection

Introduction

Urinary tract infections (UTIs) are a common condition causing individuals to seek medical care.[1] Among the populations at special risk for UTI are older adults.[2] UTI has been reported to be the second most common infection among older adults living in the community setting, as well as the leading site of infection in adults in long-term care facilities.[2,3]

Escherichia coli is reported as the most prevalent pathogen causing UTI.[1,4–6] However two recent reports from our institution indicated that *Staphylococcus aureus* is the most prevalent organism.[6,7] There has also been an increase in the emergence of resistant uropathogens to antimicrobial agents among the elderly.[2] There are no reports of UTI among the elderly in our institution, and to the best of our knowledge, in Nigeria. Therefore, this study aimed to determine the prevalence of UTI among the elderly. Etiological agents and their susceptibility profiles were also determined.

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Materials and Methods

Study population

A total of 943 patients (≥60 years) with signs and symptoms of UTI were recruited for this study. The patients were attending various clinics in the University of Benin Teaching Hospital from the 1st September, 2009 to 31st May, 2010. Verbal informed consent was obtained from all subjects prior to specimen collection. Approval for the study was given by the Ethical Committee of the University of Benin Teaching Hospital.

Specimen collection and processing

Clean-catch midstream urine was collected from each patient using boric acid as a preservative. A loopful (0.001 mL) of well-mixed urine was streaked on blood agar and cysteine lactose electrolyte deficient medium (M6; Plasmatec Laboratories, United Kingdom). The plates were incubated aerobically for 24 hours and counts were expressed in a colony forming unit (cfu) per milliliter (mL). A count of $\geq 10^5$ cfu/mL was considered significant to indicate UTI. Each urine sample (10 mL) was centrifuged at 2000*g* for 5 minutes. The supernatant was discarded and the deposit was examined microscopically at high magnification for pus cells, red blood cells, cast, epithelial cells, crystals, yeast-like cells and *Trichomonas vaginalis*. A count of pus cells ≥5 under high power field (×40 objective) was considered to indicate infection. UTI was diagnosed if the bacteria count, pus cells, or both were significantly high in an individual. The clinical isolates were identified by a standard microbiological method[8] and the paper disc antimicrobial susceptibility test for bacterial isolates was performed using the British Society for Antimicrobial Chemotherapy method.[9]

Statistical analysis was performed using the χ^2 test and odds ratio (OR) analysis using the statistical software INSTAT (GraphPad Software Inc., La Jolla, CA, USA).

Results

Male sex among elderly patients was a significant risk factor for acquiring UTI ($p<0.0001$). The prevalence of UTI decreased with increasing age ($p=0.023$, Table 1).

E. coli was the most predominant isolate in UTI among the elderly patients, including males and females. *E. coli* and *Candida albicans* were the most prevalent pathogens among females with a prevalence of 29.17% for each (Table 2).

Table 1 Effect of gender and age on the prevalence of urinary tract infections among the elderly

Characteristics	No. tested	No. infected (%)	OR	95% CI	*p*
Sex					
Male	362	80 (23.10)	6.584	4.081,10.621	
Female	581	24 (4.13)	0.152	0.094,0.245	<0.0001
Age (yr)					
60–69	332	48 (14.46)			
70–79	320	35 (10.94)			
80–89	230	19 (8.26)			
90–99	61	2 (3.28)			0.023

OR: odds ratio; CI: confidence interval.

Table 2 Prevalence of microbial agents of urinary tract infections among the elderly

Organisms	Males *n* (%)	Females *n* (%)	Total *n* (%)
Escherichia coli	32 (39.02)	7 (29.17)	39 (36.79)
Klebsiella pneumoniae	20 (24.39)	4 (16.67)	24 (22.64)
Enterobacter species	1 (1.22)	1 (4.17)	2 (1.89)
Proteus species	2 (2.44)	1 (4.17)	3 (2.83)
Providencia species	6 (7.32)	0 (0.00)	6 (5.66)
Acinetobacter species	5 (6.10)	0 (0.00)	5 (4.72)
Pseudomonas aeruginosa	2 (2.44)	0 (0.00)	2 (1.89)
Alcaligenes species	5 (6.10)	0 (0.00)	5 (4.72)
Staphylococcus aureus	8 (9.70)	4 (16.67)	12 (11.32)
Candida albicans	1 (1.22)	7 (29.17)	8 (7.55)
Total	82 (77.36)	24 (22.64)	106 (100)

Antimicrobial susceptibility results showed poor to moderate susceptible patterns (≤67%). *Alcaligenes* species were all resistant to antimicrobial agents used (Table 3).

Discussion

The elderly are at increased risk of UTI, which is reported to be the second most common infection in the community setting and long-term care facilities.[1,3] Our study investigated the prevalence, etiological agents, and the antimicrobial susceptibility profile of UTI among elderly patients.

We found that 104 (11.03%) out of 943 patients had UTI, lower than previously reported.[2] In the current study, males had an increased risk of developing UTI compared with females, which is inconsistent with previous reports.[3,11] Other studies have shown that females have a higher prevalence of UTI than males.[4,7,10] The reason for the higher prevalence in males in our study is unclear. Chronic urinary retention associated with prostate hypertrophy, bacterial prostatitis, and incontinence are the principal risk factors for UTI in elderly males.[11,12]

Other investigators have reported that the prevalence of UTI is increased with increasing age in the elderly.[1] In contrast, our study found that the prevalence of UTI significantly decreased with increasing age from 14.46% (60–69 years) to 3.2% (90–99 years). The reason for this finding is unclear. It has been suggested that there is an increased prevalence in comorbidities, a known risk factor for UTI in the elderly, between 60 and 69 years.[2] However, further studies are required to clarify this issue.

We found that *E. coli* were the most predominant isolates causing UTI in both sexes. This is in agreement with previous findings,[13] but it is inconsistent with recent reports in our area.[7,10] The reason for this could be because these recent reports were on asymptomatic subjects, while our results focused on symptomatic patients. We observed that among females, *C. albicans* had the same prevalence as *E. coli* (29.17%). However, a prevalence of 1.22% in *C. albicans* among males was observed. The presence of *Candida* in urine may be due to antibiotic use or other underlying infections, such as diabetes mellitus and indwelling catheters.[14]

The antimicrobial susceptibility profile showed poor to moderate susceptibility with less than 67% among most of clinical isolates tested. We found that two strains of *Enterobacter* species were all susceptible to cefotaxime, which is in agreement with one previous report.[2] Extensive use of antimicrobial agents in the elderly, as well as a poor functional status have been implicated as likely reasons for harboring resistant flora.[2,11] It is also notable that

Table 3 Susceptibility profile of bacterial isolates*

Antibacterial agents (μg/disc)	*Escherichia coli* (*n*=39)	*Klebsiella pneumoniae* (*n*=24)	*Enterobacter* species (*n*=2)	*Proteus* species (*n*=3)	*Providencia* species (*n*=6)	*Pseudomonas aeruginosa* (*n*=2)	*Staphylococcus aureus* (*n*=12)	*Alcaligenes* species (*n*=5)
AUG (30)	5 (12.8)	1 (4.2)	0 (0.0)	1 (33.3)	2 (33.3)	0 (0)	2 (16.67)	0 (0)
CXM (30)	11 (28.2)	4 (16.7)	1 (50.0)	1 (33.3)	2 (33.3)	0 (0)	0 (0)	0 (0)
CAZ (30)	6 (15.4)	2 (8.3)	1 (50.0)	1 (33.3)	0 (33.3)	0 (0)	1 (8.3)	0 (0)
CTX (30)	19 (48.7)	14 (58.3)	2 (100)	2 (66.7)	2 (33.3)	0 (0)	4 (33.3)	0 (0)
CN (10)	6 (15.4)	4 (16.7)	1 (50.0)	0 (0)	0 (0)	0 (0)	2 (16.7%)	0 (0)
F (30)	11 (28.2)	6 (25.0)	1 (50.0)	1 (33.3)	2 (33.3)	1 (50.0)	0 (0)	0 (0)
OFX (5)	3 (7.7)	2 (8.3)	0 (0)	0 (0)	2 (33.3)	1 (50.0)	1 (8.3)	0 (0)
SXT (25)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (8.3)	0 (0)
OB (5)	ND	ND	ND	ND	ND	ND	0 (0)	ND

*Values are *n* (%). AUG: amoxicillin-clavulanate; CXM: cefuroxime; CAZ: ceftazidime; CTX: cefotaxime; CN: Gentamicin; F: nitrofurantoin; OFX: ofloxacin; SXT: sulfamethoxazole-trimethoprim; OB: cloxacillin; *n*: number tested; ND: not done.

prescription of antibiotics without laboratory guidance, as well as counter sales of antibiotics without prescription are rife in the Nigerian setting, and this has been suggested as the possible reason for the increased resistance observed in the country.[10] Prudent use of antibiotics is advocated to stem the tide.

In conclusion, an overall prevalence of 11.03% UTI among the elderly was observed. We found that male sex was a significant risk factor for acquiring UTI among the elderly, and the prevalence of UTI decreases as age increases. *E. coli* were the most prevalent isolates causing UTI. Careful use of antibiotics is advocated due to the poor antibacterial susceptibility profile.

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